July 22, 2021

Ex Parte

Marlene H. Dortch, Secretary
Federal Communications Commission
45 L Street NE
Washington, DC 20554

Re: *Unlicensed Use of the 6 GHz Band*, ET Docket No. 18-295; *Expanding Flexible Use in Mid-Band Spectrum between 3.7 and 24 GHz*, GN Docket No. 17-183

Dear Ms. Dortch:

On June 23, Southern Company submitted a letter describing the results of a set of tests that it conducted with EPRI near Columbus, GA.[1] We were disappointed to see that, more than a year after the Commission's unanimous decision to authorize unlicensed low-power indoor devices in the 6 GHz band, Southern continues to focus its efforts on undermining that decision. The result of this approach is yet another set of advocacy-driven tests which, rather than attempting to fairly assess the interference risk, appear specifically designed to create unrealistic situations where, according to Southern, harmful interference could occur.

Like each report before it, the June 23 filing does nothing to advance the strong public interest in improving Americans' access to wireless broadband. It also in no way undermines the FCC's carefully reasoned order authorizing 6 GHz unlicensed use. Instead, the report is wrapped in exaggerated and misleading rhetoric that obscures important methodological flaws and limitations. For example, the test report:

- Assumes a series of contrived and improbable RLAN test locations;
- Uses a definition of harmful interference that the Commission rejected;
- Improperly ignores the improbability that interference would occur at the same time as deep multipath fading;
- Incorrectly assumes that RLAN access points would always operate in the 6 GHz band and always transmit co-channel with a given fixed link; and
- Relies on derived interference values that produced significant unexplained anomalies in the reported results.

[1] Southern's consultants Lockard & White also participated in the study and apparently prepared the test report.

Southern—yet again—improperly assumes away factors that the Commission found to be critical in accurately assessing the risk of harmful interference.[2] Instead, the Southern/EPRI test report highlights exactly the "contrived situation[s]" that the Commission found to be inappropriate bases for sound spectrum policy.[3] Strikingly, although Southern extrapolates from its test results to claim that harmful interference *could* occur if the test conditions persisted indefinitely, Southern once again does not demonstrate any actual disruption to its link's operations, even though its tests ostensibly were designed to cause interference.

As a result, the study does not undermine the Commission's now well-settled conclusion that 6 GHz low-power indoor access points do not pose a material risk of harmful interference to incumbent licensees operating in the band.

I. The Study Provides Data on Locations Carefully Selected to Support Southern's Advocacy Goals Rather than Considering a Real-World Range of Locations.

Southern makes broad claims about the implications of the test results, but the Southern/EPRI testing focuses exclusively on RLAN devices in carefully selected and often highly contrived locations. First, the testing focuses exclusively on the small minority of cases where there is unobstructed line of sight from a building to a fixed-service receiver and assumes that a 6 GHz enabled device is operating there. For example, the report acknowledges that, although Southern and EPRI identified a site that "looked good as a test location," they decided against providing the Commission data based on this site because:

> Upon arrival, preliminary testing found the area was obstructed by buildings and foliage between the location and the Columbus FS tower, as well as the lay of the land appearing lower than expected from Google Earth – there was no visibility of the tower. No additional testing was performed here.[4]

Taking this even further, the reported results focus on measurements taken where RLAN access points were artificially placed in locations where consumers simply would not install them, such as on elevated surfaces directly in front of windows or just behind open doors where residents would have to step around them to exit.[5] Ordinarily, users install indoor RLAN devices to maximize indoor coverage, not to maximize the energy transmitted out of a window or door.

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[2] *Unlicensed Use of the 6 GHz Band; Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz*, Report and Order and Further Notice of Proposed Rulemaking, 35 FCC Rcd. 3852, ¶ 127 (2020) ("6 GHz Order").

[3] *Id*. ¶ 150.

[4] *See, e.g.,* Test Report on the Effects of 6 GHz Unlicensed RLAN Units on Fortson to Columbus Microwave Link, 39 ("Southern/EPRI Test Report"), *as attached* to Southern Letter.

[5] *See, e.g.,* Southern/EPRI Test Report at 36, 37, 42, 43, 49, 50, 42.

By focusing on these highly-contrived situations, Southern and EPRI's report unjustifiably inflates the risk of harmful interference.

These errors highlight the report's most basic flaw: Southern and EPRI's testing provides no information at all on the actual risk of harmful interference. Instead, Southern's test was specially designed to maximize the interference potential of the RLAN devices to its link, hoping that the Commission would mistake this for a real-world demonstration of interference risk. But the Commission should not be fooled. Southern provides no evidence to suggest that the situations it has contrived are representative of real-world situations and, therefore, fails to show that there is a material risk of harmful interference.

Fig. 1 — Examples of unrealistic device locations used in the Southern/EPRI testing.

II. The Study Uses Unreliable Measurement Techniques and an Inappropriate Definition of Harmful Interference.

The Southern/EPRI test report asserts that the testing defined harmful interference using "the FCC threshold for reportable harmful interference of -6 decibel (dB) interference-to-noise ratio (-6 dB I/N)."[6] But the report fails to disclose that the FCC has explicitly rejected Southern's

[6] Southern/EPRI Test Report at 6.

assertion that mere exceedance of this level constitutes harmful interference. Although the 6 GHz Order uses this "conservative" threshold for AFC-based determinations, because those require calculations on a case-by-case basis, the Commission clearly stated that it was "not making a determination that any signal received with an I/N greater than -6 dB would constitute 'harmful interference.'"[7]

As the 6 GHz Order illustrates, a cognizable case of harmful interference requires more than the mere detection of energy above a certain level—it requires a material, adverse effect on a fixed link. In practice, the Commission noted that this will only happen if "deep atmospheric multipath fade [were to occur] at the same time the microwave receiver receives an excessively high powered transmission from an unlicensed device, such that natural losses due to separation distance, clutter, and terrain do not sufficiently diminish the power received from the unlicensed device."[8] By removing fade margin and every other statistical factor that the Commission discussed in the 6 GHz Order, Southern fails to provide a real-world assessment of the interference risk.

In addition to using an inappropriate metric for harmful interference, Southern and EPRI derive this metric in a manner that leads to widely varying results. Southern and EPRI derive I/N values using a process that depends on the performance of their own fixed-link receiver, and not just the amount of RLAN energy received. This results in wide swings in the test outcomes, evidencing a poorly controlled experiment with what appeared to be unrepeatable—and unverifiable—results.

III. Even Under these Contrived Conditions, Southern and EPRI Apparently Could Not Trigger any Link Disruption or Outage.

Strikingly, even under the artificially constructed conditions of the Southern/EPRI tests, a careful reading of the test report's results suggests that energy from RLAN devices *still* did not cause any material impact on the fixed link when it was operating under normal operating conditions, much less link outages. The test report notes that one of Southern's and EPRI's first steps—even before identifying RLAN test sites—was to artificially reduce the transmit power of the link.[9] Southern's claims of harmful interference are based on its own *further* reductions in link transmit power in the presence of RLAN transmissions, which Southern apparently intended as a means of gauging potential reduction in link margin.

This is telling. The fact that, in each case, Southern needed to reduce its own power in order to document any material effect confirms that RLAN transmissions alone *did not disrupt the links*. Southern may assert that its measured reduction in margin increases the link's susceptibility to atmospheric fading. But, as the Commission has found, "potential degradation

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[7] 6 GHz Order ¶ 130 note 337.

[8] *Id*. ¶ 143.

[9] Southern/EPRI Test Report at 28.

of a microwave link will only occur"[10] if both a deep multipath fade and an "excessively high powered transmission from an unlicensed device"[11] occur simultaneously—a confluence of events the Commission predicted would be unlikely and fleeting, in the rare event that it occurs at all.[12] By artificially reducing transmit power, Southern and EPRI effectively *assume* that RLAN energy was received at the same moment as atmospheric fading, thereby obscuring the small probability that such an event would occur in practice. They also ignore that this unlikely event would need to occur in the presence of RLANs placed in the contrived positions selected by Southern and EPRI. In addition, EPRI and Southern assume the worst case: that fading will always only affect the desired microwave transmission and will not also impact the RLAN transmission.

IV. The Study Ignores Other Important Statistical Factors.

Some of the most important statistical factors that the testing omitted, including the improbable placements of many of the RLAN devices and the improbability that interference would occur at the same moment as deep multipath fading, have been discussed above. But Southern and EPRI's testing overlooks other factors as well. For instance, Southern and EPRI artificially configured the RLAN access points to always operate on the same channel as the fixed link. In reality, it is far more likely that a given access point will use one of the numerous other 6 GHz channels available for low-power indoor use.

In fact, the assumption that the RLAN access point will operate in the 6 GHz band at all ignores yet another important statistical factor. Although we expect 6 GHz adoption to be widespread, not all RLAN access points will support 6 GHz (just as not all access points in use today support 5 GHz) and, even if an access point supports 6 GHz operations, a given transmission may still occur in the 5 GHz or 2.4 GHz bands. The test report wrongly assumes that all access points will support 6 GHz and that all transmissions from that access point will always use the 6 GHz band, co-channel with a given fixed link.

V. The Test Report Contains Unexplained Anomalies that Call its Reliability into Doubt.

Although the test report claims that the test methodology adequately accounted for variations in atmospheric fade over time, anomalies in the test results call these assertions into question. Multiple aspects of Southern and EPRI's reported results suggest that received RLAN power levels varied significantly from test to test when they should have remained roughly the same.

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[10] 6 GHz Order ¶ 143.

[11] *Id*.

[12] *Id*. ¶¶ 141-144.

In particular, the test results reflect wide variations in the apparent change in received energy when increasing Wi-Fi utilization rates. While it is not unexpected that increasing duty cycles would increase the energy received at a fixed receiver, that increase should be roughly comparable between tests and locations. But this is not the case in the Southern/EPRI measurements. For instance, for the ASUS access point tested in the window of Fred's Tire, increasing from beacon-only traffic to "Low Speed Data (<100Mbps)" apparently increased the received energy by 5.3 dB.[13] Yet, when testing that same access point at the Fred's Tire "front corner of service," the same change in utilization apparently increased received energy by 10.1 dB—three times more than the same access point tested in the window of the same building.[14] In the window of Wing Place, the change was even more dramatic: while the increased traffic resulted in a 5.3 dB increase in received energy in the window of Fred's Tire, it resulted in a 23 dB increase in the window of Wing Place—a difference of nearly 60-fold.[15] While it is natural for these values to vary moderately, test-to-test swings from 5.3 to 10.1 dB and from 5.3 to 23 dB demand further explanation.

Southern and EPRI's testing of different fixed-link modulations reveals similar discrepancies. The results appear to indicate significant changes in the received energy levels depending on the modulation of the *link*, a factor that should have no bearing at all on the received RLAN energy.

While it is impossible to deduce the cause of these major inconsistencies, they cast significant doubt on the test report's conclusions. Among other possible errors, these discrepancies call into question whether I/N values were correctly calculated or whether the analysis properly controlled for environmental fading.

VI. The Southern/EPRI Wi-Fi "Census" is Misleading and Irrelevant

The Southern/EPRI test report describes the results of a "census" of 3,003 existing Wi-Fi access points in the test area in or near the path of the fixed link. They claim that this large number of access points "certainly validates that the area tested is representative of an area highly likely to contain interfering unlicensed LPI devices."[16] But this incorrect assertion simultaneously ignores *all* of the statistical factors that the Commission rightly concluded would minimize the risk of harmful interference. In fact, Southern/EPRI's own sustained failure to account for these factors makes it impossible to draw any valid connection between the test results, the number of RLAN devices in operation, and the true risk of harmful interference.

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[13] Southern/EPRI Test Report at 55, Figure 58 (row labeled "Fred's Tire ASUS in window").

[14] *Id*. (row labeled "Fred's Tire ASUS front corner of Service").

[15] *Id*. (row labeled "The Wing Place ASUS in window").

[16] Southern/EPRI Test Report at 54.

Southern's disregard for these statistical factors also underlie its incorrect assertions about aggregate interference. Southern continues to rely on the discredited claim that the power from each access point simply combines with the power of every other nearby access point, creating a risk of aggregate interference. As the Commission explained in the 6 GHz Order, "...discussions of aggregate interference from Wi-Fi devices cannot simply add the power received from the individual access points to calculate the received interference."[17] As the Commission correctly recognized, independent access points deployed at separate locations will be located at different angles, distances, elevations, relative to a given receiver, meaning that their signals will be attenuated by varying amounts of clutter, building entry loss, and other factors. In addition, such access points independently choose which band, channel, and power level to use and transmit both at low duty cycles and in response to different user interactions, making it highly improbable that any two access points will transmit simultaneously at any given time. This is why "[t]he Commission did not propose, nor . . . find that there is any need, to consider the effect of aggregate interference from multiple access points to point-to-point microwave links."[18]

VII. Southern and EPRI's Measurements Confirm the Commission's Assumptions about Building Entry Loss

While some parties have attacked the Commission's use of a 20 dB median building entry loss figure in some of the Order's analyses, the 6 GHz Order rightly observed that building entry loss will greatly attenuate RLAN signals, protecting licensees.[19]

The Southern/EPRI test report supports the Commission's conclusion. Although a prominent incumbent once claimed, on the record, that an RLAN device just inside a window "[f]rom an interference standpoint ... might as well be outdoors,"[20] the Southern/EPRI testing demonstrates that the windows of one test location, Fred's Tire, caused 21.2 dB of building entry loss. The report concedes that this is 0.6 dB higher than the *median* figure used in the Commission's analyses.[21]

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[17] 6 GHz Order ¶ 142.

[18] *Id*. ¶ 72.

[19] *See, e.g.*. Letter from Michael Goggin, AT&T, to Marlene H. Dortch, FCC, ET Docket No. 18-295 attachment at 4 (filed Mar. 26, 2020). *But see* 6 GHz Order ¶127 (explaining that these examples were only designed to illustrate that the risk of interference was insignificant, even using the unreliable techniques used by incumbents).

[20] Comments of Fixed Wireless Communications Coalition, ET Docket No. 18-295, 22 (filed Feb. 15, 2019).

[21] Southern/EPRI Test Report at 35.

The latest Southern/EPRI test report represents another flawed attempt to demonstrate a risk of harmful interference. Yet again, the study is plagued by significant discrepancies, inappropriately focuses on contrived RLAN configurations rather than real-world operational use cases, and incorrectly identifies as "harmful interference" an abstract numerical threshold that fails to show any material impact on a fixed link. In each case, Southern and EPRI run afoul of accepted engineering practice and the Commission's own determinations in the 6 GHz Order. Moreover, the study fails to identify any actual disruption to the link during normal operations.

As a result, the study does not undermine the Commission's now well-settled conclusion that 6 GHz low-power indoor access points do not pose a material risk of harmful interference to licensees.

Respectfully submitted,

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